OS-3 REFERENCE MANUAL
for OS-3 Version 4.3

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PREFACE

This manual provides an accurate description of control
mode instructions, file structure, and job initialization
for OS-3 Version 4.3. It does not include detailed des-
criptions of particular software systems. A user, with
this manual and the manuals about the particular software
package he is using should, however, be able to use the
system with very little additional assistance.

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A BRIEF INTRODUCTION TO OS-3

"OS-3" is really a shorthand form of OSOSOS. This is an acronym for Oregon State Open Shop Operating System. With OS-3 each user is totally independent of all other users. OS-3 allows great flexibility in the use of commands and programming languages.

OS-3 runs on a Control Data Corporation 3300 or 3500 computer. The Oregon State University computer currently includes about 98,000 words of memory, with magnetic disks for additional information storage. Input can be presented to the computer from the card reader, magnetic tapes, CRT terminals, Teletypes or Graphics terminals. Output can be punched on cards, printed on a line printer, plotted on an X-Y plotter, written on magnetic tape, or listed on Teletype or CRT terminals. Users may also store information permanently on the magnetic disks.

OS-3 is a time-sharing system. This means that many users may be using the computer simultaneously with each user having the impression that he, alone, has the entire computer facility at his disposal. This is accomplished by time-slicing and memory-swapping. These techniques involve allowing each user to utilize all necessary facilities for a time interval of about 100 milli-seconds on a "round robin" basis. Only the portion of a user's program which is needed for a particular 100 millisecond time slice is actually in the computer memory at that time; the remainder of the program is stored on the magnetic disks.

The following terminology is used throughout this manual:

> BATCH   --A job in which the user is not in conversational mode with OS-3. This type of job normally uses cards as the input medium.

REMOTE
 BATCH   --A job submitted from any remote terminal
                which is to be run as a batch job.

CONVERSATIONAL
 MODE   --The user at a Teletype or CRT terminal inter-
                acts with OS-3.

 FILE   --May mean either of the following:
                (a) a type of disk storage area under OS-3
                in which information is referenced in a
                sequential manner. It closely simulates a
                magnetic tape. In this context, FILE is
                usually capitalized.

                (b) any type of data structure. In this
                context it is written in lower case letters.
                While it may seem that (a) is a special case
                of (b), the context in which it is used
                should remove any ambiguity.

 JOB NUMBER   --A 6-digit number assigned by the Computer
                Center for billing purposes.

 LUN   --Logical Unit Number. All input/output
                under OS-3 is with LUNs. (See section
                on EQUIP page 28.)

 TASK   --The word TASK is used to define a LUN to
                be the future input unit for a remote
                batch job.

 TELETYPE   --Any terminal that transmits 8-bit ASCII
                codes. This includes model 33, 35, and
                37 Teletypes, Teletype-compatible CRTs,
                and Tektronix graphic terminals.

TV   --A Control Data 210 or 211 display and entry
                  terminal. (Note that Tektronix terminals
                  are considered Teletypes.)

USER CODE   --A 4-character alpha identifier used to pro-
                  vide access security to OS-3.

There are two types of batch jobs under OS-3, the only difference being the origin of the input. Remote batch jobs are the result of copying card images onto a TASK unit. Card reader batch jobs are jobs submitted from regular 80-column Hollerith cards. Batch jobs must start with a job card in one of the following formats:

$^7_8$JOB,JOB NUMBER,USER CODE,USER IDENTIFICATION

$^7_8$JOB,JOB NUMBER,USER CODE,61=NAME,USER IDENTIFICATION

The USER IDENTIFICATION is any distinctive, identifying information which the user selects to identify his deck so that it may be returned to him by the Computer Center staff.

The NAME parameter is used mainly for remote batch jobs. It is used to change LUN 61 from a line printer to a saved file. If it is used, all information that is written onto the standard output unit (LUN 61) will appear on the named file (including all control cards). (See the section on the EQUIP statement for a detailed explanation of logical unit assignments.)

Remote batch is designed to be used when a user has a large time-consuming job that he does not want to wait for at a terminal. To use remote batch, a user equips a LUN to TASK (see section on EQUIP) and by using COPY statements or the EDITOR, creates a file of card images that will run his job. All control cards should be present as in a card batch job. When he is finished and unequips the LUN or logs off, the system will queue the job to be run following previously submitted remote batch jobs. From remote terminals a left bracket, [, is used in place of the multiple $^7_8$ punch.

JOB INITIATION FROM TELETYPE

The following procedure should be used to initiate remote use from a Teletype using OS-3.

1. Turn the Teletype power switch to the LINE position.
   If the Teletype chatters out of control, then the
   Teletype has been disconnected at the Computer Center.
   If this occurs, shut off the Teletype, call the com-
   puter operator and ask to have your Teletype connected.
   Be sure to specify which Teletype you wish to use.
   (The Teletype number for most Teletypes is written
   on the front or top of the machine.) Allow a reasonable
   amount of time for the operator to connect the Teletype,
   and then turn the power switch back to the line posi-
   tion. When the chattering has stopped you may proceed.

2. Depress "Control Shift A"; the Teletype should respond
   by printing a pound sign (#) at the left margin of a
   new line. You now have approximately <u>twenty (20)
   seconds</u> to enter your job number and user code
   separated by a comma but no spaces; follow your user
   number with a carriage return. For example:

       712345,3751   (CR)

3. If the numbers are valid, the Teletype will overprint
   these numbers so that they are unreadable, print out
   the current date and time, the internal OS-3 terminal
   number of the user, and then enter control mode (see
   Page 10) for the next command. If the numbers are
   invalid, an appropriate error message will be provided.
   If after typing the carriage return nothing happens,
   go back to step 2 because your 20 seconds have elapsed.

   NOTE: Do not press BREAK while the date and terminal
   numbers are being printed because credits for bad

runs cannot be given unless these are typed on the
output to provide definite identification.

If at any time you have a Teletype malfunction call
the computer operator and tell him both the Teletype
and terminal numbers of the machine you are using.

To initiate a job from a TV terminal, first clear the screen.
Then type a '≠' (shift 7) and type your job number and user
code and press SEND. If the number you typed was valid, OS-3
will print out the date, time, and the internal terminal num-
ber of your TV terminal, and put you in control mode. For
example:

    ≠712345,KING▲

DISK FILE STRUCTURES AND FILE NAMING

If the user enters an invalid control mode instruction the command is assumed to be the name of an overlay file and an attempt is made to ovload the file (see OVLOAD instruction). If the file does not exist or is not in proper form, then "ILLEGAL CONTROL STATEMENT" is printed.

There are two types of file structures under OS-3. One is called a "FILE", the other a "RAF" (RANDOM ACCESS FILE).

A FILE is a sequential access device that resembles a magnetic tape. A user can read, write, rewind, and search for file marks on a FILE. If a user writes in the middle of a FILE, all previously written information past that point becomes inaccessible to him.

A RAF is a simulated word addressable drum or disk unit of N words ($N \leq 2^{18}(2^9-2)$). The words are numbered from 0 to N-1. A user can locate to any word on the RAF by use of the SEEK function in FORTRAN or by using the SEEK instruction in COMPASS. Since there is a higher cost associated with processing RAF units than FILE units, the user should use FILEs if possible.

If a user wants to keep a file on a permanent basis, he has to save it (see section on SAVE). If a user wants a file to be public (accessible from all job number,user code pairs) the first character must be an *. If he wants the file to be semi-public (accessible from all user codes on the job number that created the file) the first character must be an ↑.

Unless a public or semi-public file is read-only (file protected), any user who has access to the file can write, release, delete or

destroy the file in addition to reading, rewinding, etc. There-
fore, a user should file-protect all public files that do not
need to be write-enabled to prevent them from being written on or
destroyed.

If a file name has more than eight characters, only the first
eight are used.

OS-3 CONTROL MODE INSTRUCTIONS

Instructions may be given to the OS-3 operating system whenever the computer is in control mode. Control mode is indicated on the Teletypes by the pound sign (#) printed at the left-hand margin of the Teletype page. Control mode instructions from the batch or remote batch are indicated by the digits 7 and 8 multipunched on card column 1. TV control mode is indicated by $\neq$ in the upper left corner of the screen.

Any time that a user at a Teletype wishes to get to control mode, he may do so by depressing "Control Shift A". The printer carriage will return, line feed, and print #. A TV user may get into control mode by pushing <reset>, $\neq$, and <send>.

All control mode instructions executed by batch jobs are listed on the line printer (logical unit 61) as they are executed.

Only card columns 1 through 72 are examined for control mode instructions submitted from batch jobs. However, the entire 80 columns of the card are printed.

All control mode instructions entered from a Teletype must be followed by a carriage return. Those from a TV terminal must be followed by <send> or <return>.

Unless otherwise noted in this manual, all control mode commands may be given by either remote users (Teletypes and TVs) or batch users.

Whenever OS-3 is ready for the user to enter another control mode instruction, a Teletype will line feed and print # at the left-hand margin. A TV will clear and put a $\neq$ in the upper left corner of the screen.

To cause an invalid or undesired control mode instruction
to be ignored from a Teletype, depress "Control Shift A"
instead of carriage return. The Teletype will respond with
a line feed and # printed at the left margin. TV users
can just clear the screen, type ≠ and retype the command.

Control Mode commands may not be entered from the paper
tape reader on a Teletype.

The OS-3 control statements are described in alphabetical
order on the following pages and use the following nota-
tions:

      [ ]   optional item or items
      [ ]...   optional item or items that may be repeated
      < >   required item or items
      LUN   logical unit number
      NAME   file name

ALGOL [,A [=LUN]] $\left[,I \left[\begin{array}{l} \text{=LUN} \\ \text{=NAME} \end{array} \right] \right]$ [,L [=LUN]]   [,P [=LUN]]

[,X [=LUN] [,R]]

This control mode instruction causes OS-3 to load the Algol
compiler. For each of the parameters described below, any
group of letters may be substituted for the single letter
shown to the left of the equal sign. The first letter of
the group must be as shown below, however.

A=LUN   This specifies that an assembly language
             listing of the program is to be prepared
             and sent to the logical unit specified. If
             no LUN is specified, then LUN 61 is assumed
             unless a LUN is specified in the L parameter.

I=LUN   This specifies that the input to the Algol
             compiler is to come from the logical unit
             specified. If no LUN is specified, LUN 60
             is assumed. The logical unit number in this
             parameter may be replaced by the name of a
             saved file. Input logical units are re-
             wound, if possible, by the Algol compiler
             before reading.

L=LUN   This specifies that a listing of the source
             program is to be sent to the logical unit
             listed. LUN 61 is assumed if no LUN is
             specified by the user.

P=LUN   This functions exactly as X, except that LUN 62
             is assumed if no LUN is specified.

R   This parameter is used in conjunction with the
             X parameter to specify that the Algol com-
             piler is to call the loader after compila-
             tion if there were no fatal errors.

X=LUN   This specifies that the output from the Algol

compiler (binary object program) should be
sent to the logical unit specified. If no
LUN is specified, then LUN 56 is assumed.

All logical units specified in the Algol control mode
instruction must have been previously defined by the user.
Any of the parameters A,I,L,P,R,X may be omitted; the
desired ones may be listed in any order. Only the most
common Algol parameters are listed above; others are dis-
cussed in the Algol manual (Control Data publication
No. 60214900).

This control mode instruction will destroy any interrupted
program so that it may not be restarted with a GO command.

Examples of Algol control mode instructions are:

```
ALGOL,  I=45,L=67,P=89,A=91
ALGOL,L,X
ALGOL,INPUT=33,A=61,X=3,L=47
ALGOL,L,X,R
ALGOL,I=TEST,L,X
```

```
ASSEM  ⎡    ⎡=LUN[/R]⎤⎤  ⎡   ⎡=LUN[/R]⎤⎤  ⎡   ⎡=LUN[/R]⎤⎤
       ⎢,D  ⎢         ⎥⎥  ⎢,I ⎢         ⎥⎥  ⎢,L ⎢         ⎥⎥
       ⎣    ⎣=NAME    ⎦⎦  ⎣   ⎣=NAME    ⎦⎦  ⎣   ⎣=NAME    ⎦⎦

       ⎡    ⎡=LUN[/R]⎤⎤  ⎡   ⎡=LUN[/R]⎤⎤  ⎡   ⎡=LUN[/R]⎤⎤
       ⎢,P  ⎢         ⎥⎥  ⎢,R ⎢         ⎥⎥  ⎢,S ⎢         ⎥⎥
       ⎣    ⎣=NAME    ⎦⎦  ⎣   ⎣=NAME    ⎦⎦  ⎣   ⎣=NAME    ⎦⎦

       ⎡    ⎡=LUN[/R]⎤⎤
       ⎢,X  ⎢         ⎥⎥
       ⎣    ⎣=NAME    ⎦⎦
```

This control mode instruction causes OS-3 to load the ASSEMBLER. For each of the parameters described below, any group of letters may be substituted for the single letter shown to the left of the equal sign. The first letter of the group must be as shown below, however.

If any LUN is followed by /R the LUN will be rewound before it is used.

> D=LUN This parameter specifies that a short form of diagnostic messages will be sent to the LUN specified. If no LUN is specified, then logical unit 61 is assumed.

> I=LUN This specifies that the input to the assembler is to come from the logical unit specified. If no LUN is specified, then LUN 60 is assumed.

> L=LUN This specifies that a listing of the source program is to be prepared on the LUN specified. If no LUN is assigned, LUN 61 is assumed.

> P=LUN This specifies that the output (binary object program) from the assembler should be sent to

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the logical unit specified. If no LUN is
specified, then logical unit 62 is assumed.

R=LUN This instructs the assembler to prepare a
cross reference list of symbols and send it
to the LUN specified or to the same logical
unit as specified in L. If L was not speci-
fied, then logical unit 61 is assumed.

S=LUN This specifies that symbol output is to be
prepared on the LUN specified or on the
same logical unit as specified in P. If P
is not specified, it assumes the X unit; if
X is not specified, logical unit 56 is used.

X=LUN This functions exactly as P above, except
that LUN 56 is assumed if no LUN is speci-
fied.

Any of the parameters D,I,L,P,R,S,X, may be omitted; the de-
sired ones may be listed in any order. All logical units
specified in the parameter string should have been previously
defined by the user.

This control mode instruction will destroy any interrupted
program so that it may not be restarted with a GO command.

Examples of ASSEM control mode instructions are:

```
ASSEM,I=23,P=49,X=97,L=12,R
ASSEM,IN=23,XEQ
ASSEM,L,R,X
ASSEM,IN=TEST,D,X
ASSEM,X
ASSEM,X,L=43,PUNCH=62,INPUT=2
ASSEM,IN=13,S=43,L,X
ASSEM,IN=TEST,L,X
```

BASIC

This command causes OS-3 to load the BASIC compiler.

This control mode instruction will destroy any interrupted program so that it may not be restarted with a GO command.

For more information about the BASIC compiler see CCM-71-08.

An example of this command is:

    BASIC

BKSP $\left[\,\text{,LUN}\; [(\text{Number})]\,\right] \ldots$

This command causes each of the logical units listed to be
backspaced one physical record. If the LUN is not a FILE or
magnetic tape, this command will cause an error. Each of
the logical units listed in the BKSP command must have been
previously defined. After the execution of a BKSP command,
control returns to the OS-3 control mode. A logical unit
may be listed more than once; the LUN will backspace once
for each time it is listed. If it is desired to backspace
any unit more than once a repetition factor may be used. To
do this the number of backspaces desired is enclosed in par-
enthesis after the LUN. For example:

    BKSP,17(4)

will backspace unit 17 four times.

This instruction may be used without disrupting the status
of a program which has been interrupted. The program may be
resumed by using GO. Examples of this command are:

    BKSP,23,89,90,71
    BKSP,23(14)
    BKSP,34(3),17,14(10),83

BREAK

This control mode instruction will transfer control to RADAR, an on-line debugging language, without losing the status of the program which has been previously interrupted by a Teletype user depressing [CS,A] or a TV user executing [clear,≠, send]. (This is not the break key on a Teletype. You must type BREAK.)

An example of a BREAK instruction is:

    BREAK

CC

The CC control mode instruction is legal only from batch
jobs. It is used to print comments on batch job listings
and has no effect on the job being run.

Examples of the CC instruction are:

        CC   THIS IS A COMMENT LINE
        CC   UNIT 6 IS FOR INPUT UNIT 7 IS FOR OUTPUT
        CC   THIS CARD HAS NO EFFECT ON THE JOB

COBOL $\left[,I \left[\begin{array}{c} =NAME \\ LUN\,[/R] \end{array} \right] \right]$ $\left[,L \left[\begin{array}{c} =NAME \\ LUN\,[/R] \end{array} \right] \right]$ [,M] [,O]

$\left[,P \left[\begin{array}{c} =NAME \\ LUN\,[/R] \end{array} \right] \right]$ $\left[,X \left[\begin{array}{c} =NAME \\ LUN\,[/R] \end{array} \right] \right]$

This control mode instruction causes OS-3 to load the COBOL compiler. For each of the parameters described below, any group of letters may be appended to the single letter that specifies the parameter.

I   This specifies the input unit for the compiler.

L   This specifies the listing unit for the com-
            piler. If no LUN or name is present, the list-
            ing is written on LUN 61.

M   This requests the compiler to produce a memory
            map of the programs DATA division storage if no
            severe diagnostics are detected during compila-
            tion. The map is written on the L unit if a
            listing was requested or unit 61 if not.

O   This requests the compiler to produce a listing
            of the object code generated by the compiler
            if no severe diagnostics are detected during
            compilation. The object listing will be written
            on the L unit if it was specified, or on unit
            61 if not.

P   This requests the compiler to punch a binary
            deck on the specified unit. If no unit is
            specified, unit 62 is used.

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X   This requests the compiler to punch a binary
deck on the specified unit. If no unit is
specified, unit 56 is used.

Any of the parameters may be omitted and the desired ones
may be in any order. All logical units specified in the
parameter string should have been previously defined by the
user.

This control mode instruction will destroy any interrupted
program so that it may not be restarted with a GO command.

Examples of COBOL control mode instructions are:

```
COBOL,I=PROG,L,X
COBOL,L,X
COBOL,L,O,M,P
COBOL,L=17,M,X
```

COMPASS $\quad$ $\left[\text{,D[=LUN]}\right]$ $\left[\text{,I}\begin{matrix}\text{[=LUN]}\\\text{[=NAME]}\end{matrix}\right]$ $\left[\text{,L[=LUN]}\right]$

$\left[\text{,M[=LUN]}\right]$ $\left[\text{,P[=LUN]}\right]$ $\left[\text{,R[=LUN]}\right]$

$\left[\text{,S[=LUN]}\right]$ $\left[\text{,X[=LUN]}\right]$

This control mode instruction causes OS-3 to load the COMPASS assembler. COMPASS is no longer being actively supported by OS-3. New coding should be done using ASSEM rather than COMPASS (see section on ASSEM).

For each of the parameters described below, any group of letters may be substituted for the single letter shown to the left of the equal sign. The first letter of the group must be as shown below, however.

D=LUN $\quad$ This parameter specifies that a short form of diagnostic messages will be sent to to LUN specified. If no LUN is specified, then logical unit 61 is assumed.

I=LUN $\quad$ This specifies that the input to the COMPASS assembler is to come from the logical unit specified. If no LUN is specified, then LUN 60 is assumed. A saved file name may be substituted for LUN with this parameter.

L=LUN $\quad$ This specifies that a listing of the source program is to be prepared on the LUN specified. If no LUN is assigned, LUN 61 is assumed.

M=LUN $\quad$ This indicates that the library of COMPASS macro instructions will be found on the LUN indicated. A logical unit must be specified

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P=LUN   This specifies that the output (binary object
         program) from the COMPASS assembler should be
         sent to the logical unit specified. If no
         LUN is specified, then logical unit 62 is
         assumed.

R=LUN   This instructs the COMPASS assembler to pre-
         pare a cross reference list of symbols and
         send it to the LUN specified or to the same
         logical unit as specified in L. If L was
         not specified, then logical unit 61 is assumed.

S=LUN   This specifies that symbol output is to be
         prepared on the LUN specified or on the same
         logical unit as specified in P. If P is not
         specified, it assumes the X unit; if X is
         not specified, logical unit 56 is used.

X=LUN   This functions exactly as P above, except
         that LUN 56 is assumed if no LUN is specified.

Any of the parameters D,I,L,M,P,R,S,X, may be omitted;
the desired ones may be listed in any order. All logical
units specified in the COMPASS parameter string should
have been previously defined by the user. For more in-
formation, see Control Data COMPASS Reference Manual
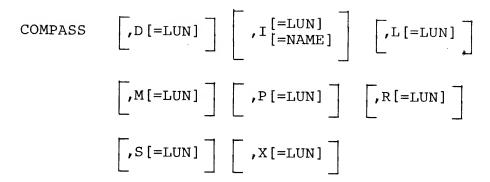(Publication number 60236800).

This control mode instruction will destroy any interrupted
program so that it may not be restarted with a GO command.

Examples of COMPASS control mode instructions are:

    COMPASS,I=23,P=49,X=97,L=12,R
    COMPASS,IN=23,XEQ
    COMPASS,L,R,X
    COMPASS,IN=TEST,D,X

$$\text{COPY} \quad [\,,\text{C= N1} \;] \quad \left[\,,\text{I} \begin{bmatrix} =\text{LUN}\,[/\text{R}] \\ =\text{NAME} \end{bmatrix}\right] \quad [\,,\text{F=<N2>}] \quad \left[\,,\text{0} \begin{bmatrix} =\text{LUN}\,[/\text{R}] \\ =\text{NAME} \end{bmatrix}\right]$$

$$[\,,\text{P=<N3>}] \quad [\,,\text{S=<N4>}]$$

$$[\,,\text{T=N5}] \quad [\,,\text{V}]$$

COPY is used to copy information from one LUN to another. An explanation of each parameter follows. On all parameters the starting letter may be followed by any character string. All parameters are optional and may appear in any order.

C   COUNT - The C parameter specifies the number of records to copy. If the parameter is omitted the input is copies to end-of-DATA unless the F parameter is present.

F   FILES - The F parameter specifies the number of files to copy. If N2 is zero all information on the input unit is copied to the output unit. The default value is zero unless the input unit is a TV, magnetic tape, or a RAF. F defaults to one in these cases.

I   INPUT - The I parameter specifies the input unit. If a name is used or a LUN is specified between 50 and 59 the unit is rewound before use. If the input unit is a LUN and the delimiting character is a / rather than a comma, the letter R (or any character string starting with R) also specifies rewinding. If the I parameter is omitted, LUN 60 (standard input unit) is assumed.

0   OUTPUT - The 0 parameter specifies the output unit. The 0 parameter uses the same rules for rewinding as the I parameter. If the 0 parameter is omit-

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ted, LUN 61 (standard output unit) is assumed.
If a name is used for output and no saved file
exists for the user with that name, the file
is created. If a LUN is used that is not al-
ready equipped the LUN is equipped to a scratch
FILE.

P   PARITY - The P parameter specifies the parity of
the output unit. If N3 is zero the output is
written in BCD, if non-zero it is written in
binary. The default value is to write the out-
put in the same parity as the input.

S   SHIFT - If <N4> is positive it specifies the num-
ber of leading blanks to be inserted at the
front of each record . If <N4> is NEGATIVE it
specifies the number of characters to be de-
leted from the front of the RECORD before it
is written onto the output device. If the par-
ameter is omitted, the default value is four
for Teletypes and line printers and zero for all
other devices. This parameter can be used to
supply carriage control for files that do not
have it, or to position lines on the line prin-
ter page. If a file with carriage control is to
be copied to a printing device N4 should be zero.

T   TRUNCATE - The T parameter is used for truncating
input records to a specified length of four-
character words. If N5 is omitted COPY will
abort with the message PARAMETER ERROR. The T
parameter may be used when copying from a magnetic
tape to specify the length (in words) of the input
records. If it is not used COPY will discover how

long the records are, though it is more effic-
ient to use the T parameter. The T parameter
may be used to remove sequence numbers from a
file by setting T=18 (72 characters). If the
output unit is a TV terminal and the user does
not specify T, T is assumed to be 250 words
(1 screen). In all other cases T is automatic-
ally set to approximately 60,000 words.

V   VARIABLE LENGTH - The V parameter specifies that
        variable length records are to be written
        (trailing blanks on BCD records or trailing
        zeros on binary records are not written out).
        This is used to save file space.

The COPY command will destroy the status of an interrupted
program such that it may not be restarted by a GO command.

Examples of COPY statements:

1) To copy a saved file to a printer on LUN 4 and auto-
    matically have single-spaced records

        COPY,I=FILENAME,O=4

2) To do the above but using carriage control already
    on the file

        COPY,INPUT=FILENAME,OUTPUT=4,SHIFT=0

3) To do the above example deleting all information
    past column 40

        COPY,IN=FILENAME,OUT=4,S=0,T=10

4) To copy a file to a saved file, changing all rec-
    ords to BCD

        COPY,I=7,OUT=FILENAME,P=0

5)   To copy the first six files from LUN 7 onto LUN 8

      COPY,I=7/REWIND,O=8,F=6

6)   To copy a file onto LUN 61 and suppress trailing blanks

      COPY,I=FILENAME,V

7)   To create a data file from a card deck

      COPY,O=FILENAME

8)   Copying a deck of cards to make a listing on the line printer

      COPY

9)   To copy the first 89 records of a file to another file and delete the first six characters of each record

      COPY,I=IN,O=OUT,C=89,S=-6

COSY   [,=LUN]   [,L [=LUN]] [,Z]   [/=<character>]

This control mode instruction causes OS-3 to load COSY.
For both of the parameters described below, any group of
letters may be substituted for the single letter shown to
the left of the equal sign. The first letter of the group
must be as show below, however.

      I=LUN   This specifies that the input to COSY is
                 to come from the logical unit specified.
                 If no LUN is specified, or I is not present,
                 then LUN 60 is assumed.

      L=LUN   This specifies that the LOG listing from
                 COSY should be sent to the logical unit
                 specified. If no LUN is given, then LUN
                 61 is assumed. If L is not present no LOG
                 listing will be produced.

      Z   This specifies that the COSY control cards
                 have free form input. The default is that
                 the key words on all COSY control cards must
                 start in column 10.

     /=<character>   This specifies that the / character
                 on COSY control cards is to be changed to
                 <character>.

All logical units specified in the COSY control mode
instruction must have been previously defined by the user.
For more information see Computer Center publication
CCM-70-6.

This control mode instruction will destroy any inter-
rupted program so that it may not be restarted with a
GO command.

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Examples of COSY control mode instructions are:

```
COSY,I=34,L=29
COSY,I,L
COSY,INPUT=73,LIST=2
COSY
COSY,LOG,Z,/=*
```

DATE   [,LUN]

This control mode instruction will cause OS-3 to print the
current date (month, day and year) as well as the current
time (to the nearest minute) on the LUN specified. Logical
unit 6] is assumed if no LUN is specified. This informa-
tion can be useful for determining what sequence of steps
were performed when many separate computer runs were used
to modify a particular problem.

This control mode instruction will destroy any interrupted
program so that it may not be restarted with a GO command.

Examples of DATE instructions are:

    DATE,43
    DATE

DELETE[,NAME]...

The DELETE command is used to remove the name of a saved file
from the file directory. The saved file may not be file pro-
tected. File protected files may be deleted by first remov-
ing the file protection, and then deleting them. By first
equipping LUN=FILENAME and then deleting the filename the user
may still refer to the information by referencing the LUN.

This instruction may be used without disrupting the status of
a program which has been interrupted. The program may be re-
sumed by using GO.

Examples of DELETE commands are:

    DELETE,PROGRAM

    DELETE,DATA

    DELETE,FILEA,FILEB,FILEZ

DESTROY [,NAME]...

The DESTROY command is used to annihilate each of the files listed. No private file can be protected from this command.

This instruction may be given without disrupting the status of a program which has been interrupted. Execution may be resumed by using GO.

This command produces the same results as the following sequence of commands:

```
EQUIP,59=FILENAME
RFP,FILENAME
RELEASE,59
DELETE,FILENAME
UNEQUIP,59
```

Examples of DESTROY control mode instructions are:

```
DESTROY,TEST,DATA,EDF
DESTROY,ESG
```

DIRECTORY[,LUN]

This control mode instruction allows users to obtain a copy
of their file names. DIRECTORY will print out a complete
list of file names saved under the job user number. More in-
formation about each file may be obtained by adding a logical
unit number or file name to the DIRECTORY call. This will
result in the file names, file length, last change date and
last referenced date to be printed.

This instruction may be given without disrupting the status
of a program which has been interrupted. Execution may be
resumed by typing GO.

Files saved during one day will not appear in the DIRECTORY
list until the next day as updates are made each night.

Users who do not wish their file names to be accessible
should contact the Computer Center.

Examples:

    DIRECTORY
    DIRECTORY,61

DO $\begin{bmatrix} \text{LUN} \\ \text{NAME} \end{bmatrix}$

This control mode instruction causes the control mode to begin obeying control statements in the specified file. Statements do not require any special character at the left, and may be control mode statements, or library calls, or overlay calls. If processing is interrupted (by break or control A, for example), it can be resumed by DO (with no LUN or NAME).

The LUN or NAME specified will always be rewound before control mode processes the first statement.

A file of control cards that is set up for remote batch processing may be run from a terminal by the use of the DO command.

Examples of DO commands are:

    DO,ZIP
    DO,5
    DO

DUMP [,ABORT] , [LUN] $\lceil$, [<STARTING ADDRESS>]

, [<ENDING ADDRESS>] $\rceil$

The DUMP command will generate an octal dump of the computer memory on the LUN specified. the <STARTING ADDRESS> and <ENDING ADDRESS> are both expressed in octal. If the <START-ING ADDRESS> and <ENDING ADDRESS> are not specified, then the contents of the entire lower bank of memory will be dumped. If the LUN is not specified, LUN 61 is assumed. The LUN used in the DUMP command must have been previously defined. After the execution of a DUMP command, control returns to the OS-3 control mode.

If the abort parameter is present the dump will be made only if the user has been aborted. Only the letter A is required to specify the abort parameter.

This control mode instruction will destroy any interrupted program so that it may not be restarted with a GO command.

Examples of control mode DUMP commands are:

    DUMP,34,13452,47233
    DUMP
    DUMP,,13452,47233
    DUMP,A
    DUMP,ABORT,13

EDIT

This command causes OS-3 to load the EDITOR.

The EDITOR, which is available to remote users only, may be used to prepare program and data files for use by other parts of the OS-3 system. For more information see Computer Center publication CCM-70-7.

This control mode instruction will destroy any interrupted program so that it may not be restarted with a GO command.

An example of an EDIT command is:

    EDIT

EQUIP[<LUN= DEVICE>] . . .

The EQUIP statement allows the user to associate logical unit
numbers with particular pieces of hardware. These devices are
subsequently referred to by LUN. The LUN must be an integer
constant between 0 and 99. Normally, the following logical
units are associated with the following devices:

LUN	DEVICE
60	STANDARD INPUT
61	STANDARD OUTPUT

Most compilers and assemblers use logical units numbered between
54 and 59. Therefore, a user should not normally use these logi-
cal units. Also some system software will unequip input units in
the range 50-59.

Logical unit 100 is permanently assigned to the user's standard
input unit. It may appear only on the right-hand side of the
equal sign (=) in an EQUIP instruction.

For remote users, standard input and standard output both refer
to the user's terminal. Batch users have the card reader as
standard input and a line printer as standard output.

The DEVICE to the right of the equal sign must be a previously
defined logical unit number (60, 61, 100, or a LUN which appears
to the left of the equal sign in an earlier EQUIP statement) or
one of the following:

FILE   The word FILE is used to define a LUN as a sequen-
        tial disk storage area. This storage area may be
        saved for future use by using a SAVE command. If
        the file is not saved, it will be destroyed when the
        user logs off, or the LUN is unequipped.

LP   The characters LP equip a line printer as an output
        device. Any information sent to this LUN will be
        printed on the high-speed line printer.

MSF <pack number> <comments to the operator>

> The letters MSF are used to equip a LUN equivalent to a user disk pack.
>
> The comment field is printed on the 3300 console to give the operators additional information about the disk pack.
>
> OS-3 will check the label on the disk to verify that the mounted pack is the one the user requested before the user's first operation is allowed to occur.

MT,<tape number><comments to the operator>
MT,<tape number> AT <tape density><comments to the operator>

> The letters MT are used to equip a LUN equivalent to a magnetic tape. Magnetic tape may be used only by jobs submitted from batch or remote batch.
>
> Tape number is the identifying number assigned by the Computer Center to the reel of tape. (Use numbers 1 through 9 for scratch tapes or tapes that do not have a number.)
>
> Tape density, if present, must be 200, 556, or 800 (all others will result in an error). If the density field is not present, 800 BPI is assumed. OS-3 automatically sets the correct density before each read or write operation.
>
> The comment field is printed on the 3300 console to give the operators additional information such as with or without ring or to use a scratch tape. (See the examples.)
>
> The word AT must be present and should be delimited by spaces if the user wants 200 or 556 BPI. (The word "BPI"

is unnecessary, and if present, is treated as part of
the comment field.)

(NAME) The (NAME) is used to equip a LUN equivalent to the
file (NAME). (NAME) may be the name of a public file,
of the name of one of the user's private files which he
has previously saved under the currently used account
number and user number.

NULL The word NULL is used to define a device which will
destroy any information sent to it. It may be thought
of as a line printer feeding directly into an inciner-
ator.

PLOT The word PLOT is used to define a LUN equivalent to
the X-Y plotter.

PTP The word PTP is used to define a LUN equivalent to the
high speed paper tape punch.

PUN The word PUN is used to define a LUN as a card punch.
Information sent to this LUN will be punched on cards.

RAF The characters RAF are used to define a random access
disk storage area. This storage area may be saved for
future use with a SAVE command. If it is not saved,
the information will be lost when the user logs off or
unequips the unit.

TASK The word TASK is used to define a LUN to be the future
input unit for a remote batch job. (See page 3 for a
description of remote batch operations.)

PUN, PLOT, PTP and LP units must be labeled to prevent loss

of output; see section on LABEL.

A particular LUN may not be used on the left of the equal
sign in an EQUIP statement more than once. If one wishes to
redefine a LUN he must UNEQUIP it first.

This instruction may be used without disrupting the status of
a program which has been interrupted. The program may be re-
sumed by using GO.

Examples of EQUIP commands are:

```
EQUIP,04=FILE,7=FILE,8=FILE
EQUIP,02=61
EQUIP,45=04
EQUIP,99=NULL,9=FILE
EQUIP,71=PLOT
EQUIP,77=100
EQUIP,1=MT 1 AT 556 TAPE WITH JOB
EQUIP,2=MT 4693 NO RING
EQUIP,3=MT 8143 AT 556 WITH RING
EQUIP,4=MT 7778
```

FORMS,<LUN, message to operator>

This command will tell the operator to put special forms
into the output device specified by LUN. This command
should also be used in cases where the user is depending
upon large amounts of materials being in the output device.

If LUN is 62 and unequipped, it will automatically be
equipped to PUN.

This control mode instruction will not destroy any interrupted
program. It may be restarted with a GO command.

Examples of FORMS commands are:

    FORMS,9, 70 feet of plotter paper needed
    FORMS,10, two-part paper 8½ * 11
    FORMS,20, need ½ roll of paper tape
    FORMS,17, blue striped cards

FORTRAN $\left[,A\left[=LUN\,[/R] \right] \right]$ $\left[,C\left[=LUN\,[/R] \right] \right]$ $\left[,D\left[=LUN\,[/R] \right] \right]$

$\left[,E \right]$ $\left[,H\left[=LUN\,[/R] \right] \right]$ $\left[,I\left[\begin{matrix} =LUN\,[/R] \\ =name \end{matrix} \right] \right]$ $\left[,K=<NUM> \right]$

$\left[,L\left[=LUN\,[/R] \right] \right]$ $\left[,M\left[=LUN\,[/R] \right] \right]$ $\left[,N=<NUM> \right]$

$\left[,P\left[=LUN\,[/R] \right] \right]$ $\left[,R\left[=LUN\,[/R] \right] \right]$ $\left[,S\left[=LUN\,[/R] \right] \right]$

$\left[,X\left[=LUN\,[/R] \right] \right]$

This control mode instruction causes OS-3 to load the FORTRAN compiler. For each of the parameters described below, any group of letters may be substituted for the single letter shown to the left of the equal sign. The first letter of the group must be as shown below, however.

If any LUN is followed by "/R", the LUN will be rewound before it is used.

A=LUN   This specifies that an assembly language listing of the program is to be written onto the logical unit specified. If no LUN is specified, the A output will go to the L device. If no L parameter was specified, the output goes to LUN 61.

C=LUN   This specifies that assembly language statements equivalent to the FORTRAN program are to be written onto the logical unit specified. If no LUN is specified, 62 is assumed.

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D=LUN   This specifies that the diagnostic error messages
         are to be sent to the LUN specified. If no LUN
         is specified, it will go to the L device. If
         no L parameter was specified, it goes to 61.

E   This parameter instructs FORTRAN to generate
         extended error checking into the compiled pro-
         gram. This extra error checking principally
         checks for array bound errors.

H=LUN   This specifies that a copy of the source deck
         for the FORTRAN program is to be written onto
         the specified LUN. If no LUN is specified, 62
         is assumed.

I=LUN   This specifies that the input to the FORTRAN
         compiler is to come from the specified LUN. If
         no LUN is specified, 60 is assumed. The logical
         unit number may be replaced by a name of a
         saved file. The FORTRAN compiler will rewind
         the input device, if possible, before reading
         from it. Input units numbered between 50
         and 59 are unequipped at the end of compilation.

K=<NUM> This informs the FORTRAN compiler which input
         card code is being used. If <NUM> is 029, then
         the input deck is taken in extended BCD code
         (EBCDIC). If <NUM> is 026 or the K parameter
         is omitted, then the input deck is taken to be
         punched in standard 026 codes. If <NUM> is 027,
         then the input deck is assumed to contain cards
         punched on both 026 and 029 keypunches. The
         K option should be used only with special
         card decks.

L=LUN   This specifies that a listing of the source
         program is to be made on the LUN specified. LUN 61
         is assumed if no LUN is specified.

M=LUN   This specifies that a list of symbols and their
         relative positions in the compiled program is
         to be written onto the LUN specified. If no LUN
         is specified, then it is written onto the L
         device. If the L parameter is not present,
         then it is written onto LUN 61.

N=<NUM> This specifies the number of lines to appear
         on each page of the listing output. If the N
         parameter is not present, FORTRAN assumes 61
         lines per page.

P=LUN   This functions exactly as X, except LUN 62 is
         assumed if no LUN is specified.

R=LUN   This specifies that binary object output
         should be sent to the LUN specified. If no LUN
         is specified, 56 is assumed. This parameter
         differs from X in that the LUN is released
         before being written on, and at the object
         output is designed as an input to the loader
         (see I parameter for the LOAD command), since
         it is terminated with a BCD record containing
         "RUN".

S=LUN   This instructs the FORTRAN compiler to write
         symbol output (for RADAR, etc.) on the LUN speci-
         fied. If no LUN is specified, then the P
         device is assumed. If no P parameter is
         present, then the X device is assumed. If the
         X parameter is not present, then the R device
         is assumed. If neither P, X, nor R is present,
         then an error occurs.

X=LUN   This specifies that the binary object output
         from the FORTRAN compiler is to be written

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onto the LUN specified. If no LUN is specified, then 56 is assumed.

All logical units specified must have been previously defined by the user. Any of the parameters (A, C, D, E, H, I, K, L, M, N, P, R, S, X) may be omitted, and the desired parameters may be listed in any order.

This control mode instruction will destroy any interrupted program so that it may not be restarted with a GO command.

Examples of FORTRAN control mode instructions are:

```
FORTRAN,I=TEST,S=33,L=67,P,A=91
FORTRAN,L,R
FORTRAN,IN=TEST,RUN=47
FORTRAN,R,INPUT=TEST
FORTRAN,I=45,C=27,X,L=18,D=61,K=029,S
```

FP $\begin{bmatrix} \text{LUN} \\ \text{NAME} \end{bmatrix}$ . . .

The letters FP are used to indicate FILE PROTECT. LUN must refer to a FILE or RAF. File protection makes a file read-only and thus prevents the user from modifying the contents of the file associated with LUN. A protected file which the user does not save will be destroyed at the end of his job. File protection may be removed by using the RFP,LUN command. If a name is used a FILE or RAF must be already saved with that name. See page 7.

This instruction may be used without disrupting the status of a program which has been interrupted. The program may be resumed by using GO.

Examples of this command are:

        FP,33,17
        FP,45
        FP,BURP

FWSP   [,LUN [(number)]] . . .

This command causes each of the logical units listed to
be forward-spaced one physical record. Each of the logical
units listed in the FWSP command must have been previous-
ly defined to be a file or mag tape. After the execution
of a FWSP command, control returns to the OS-3 control
mode. A logical unit may be listed more than once; the
LUN will forward space once for each time it is listed.

If it is desired to forward space any unit more than once,
a repetition factor may be used. To do this the number of
forward spaces desired is enclosed in parentheses after the
LUN. For example:

    FWSP,17(4)

will forward space unit 17 four times.

This instruction may be used without disrupting the status
of a program which has been interrupted. The program may be
resumed by using GO.

Examples of this command are:

    FWSP,23,89,90,71
    FWSP,23(14)
    FWSP,34(3),17,14(10),83

GO   [,Parameter string]

The GO command is used to resume computer operation after
the execution of a program has been interrupted either
by a program error which the user has since fixed, or
by the user putting himself into control mode. Control
mode instructions which will prevent the user from re-
starting a program with this command are indicated individ-
ually.

An example of the GO command is:

    GO

LABEL [,LUN] $\begin{bmatrix} \neq & \text{message} \\ / & \text{message} \end{bmatrix}$

This command allows users to write a message on an output device to facilitate the identification of the user's output at the Computer Center. If the LUN is omitted, LUN 61 is assumed.

If the first character of the message is a $\neq$, this command will simply output the message on the specified LUN in BCD form. The user carriage control is the first character after the $\neq$ if LUN is a printing device.

If the first character of the message is a / , LABEL will do different things for different types of output devices. If LUN is a punch, then the first six characters of the message are punched in block letters on a card. If LUN is an x-y plotter, then the message is written on the plotter in one-half-inch-high block letters. For all other devices one space is inserted at the front of the message and the message is output to the device in BCD form.

If LUN is 62 and LUN 62 is undefined, it will be equipped to a card punch.

Examples of the LABEL command are:

    LABEL/JONES
    LABEL,77/plot for SMITH
    LABEL,62/USER
    LABEL,14≠0 BOB SMITH

LOAD $\left[\begin{array}{l} \text{LUN [/R]} \\ \text{,NAME} \end{array}\right]$ . . . $\left[\begin{array}{l} \text{,L=}\text{LUN [/R]} \\ \text{NAME} \end{array}\right]$ . . . $\left[\begin{array}{l} \text{,I=}\text{LUN [/R]} \\ \text{NAME} \end{array}\right]$

$\left[\begin{array}{l} \text{,O=}\text{LUN [/R]} \\ \text{NAME} \end{array}\right]$

This control mode instruction calls the OS-3 binary program loader. The binary input is produced by compilers and assemblers (FORTRAN, ASSEM, COBOL and ALGOL). The information is loaded from the logical units or file names listed after the word LOAD. Any LUN followed by /R will be rewound before use. The loader information, representing programs or subprograms, is loaded in the order specified. After reading from all of the specified units, the loader will attempt to read more loader information from the unit or name after the I parameter or from logical unit 60 until a loader control statement is found. All loader control statements cause the loader to do some specific task. The legal loader control statements and their functions are listed below.

RUN   The word RUN will cause the programs just loaded to be executed. This statement will terminate all loading.

END   The word END will terminate loading. The program that has just been loaded will not be run and control returns to OS-3 control mode.

MAP   The MAP statement instructs the loader to
MAP=LUN prepare a list of how the programs occupy the computer memory. Normally the map is made on logical unit 61 unless another unit is specified. The first map made from a teletype will contain only subprogram addresses. To

obtain a complete map on a teletype it is
necessary to type MAP a second time. The
MAP statement must be followed by another
loader control statement.

RADAR   Control is given to the RADAR program.

The loader control statements (RUN, MAP, END, and RADAR)
should not be preceded by a control-A or a 7-8 punch. From
a teletype they must be terminated with a carriage return.

The loader will make an overlay of the programs on the
saved file or logical unit if the O parameter was
specified. If the saved file does not exist, the loader
will create it. The letters between the O and the
equals in OVERLAY are ignored.

An example of a job might be:

```
#EQUIP,1=FILE
#EQUIP,2=FILE
#ASSEM,I=TALLY,X=1,D

#FORTRAN,I=OUTCTDW,X=2
```

```
#LOAD  1/R,2/R,BINPROG
MAP    (CR)
```

{ NOTE: Teletype MAP contains
         only subprogram addresses.

```
SUBPROGRAMS
   73100 POWRF        73446 FORMAT      74176 FLOAT       74211 ABSF
   74222 XTOI         74442 FIXF        74511 Q1Q         74652 BCDOUT
   76143 Q8Q          76513 SIGT        76732 SALI        77331 WRITENTE
   77507 GTSHIFT      77532 READ        77565 TALLY
RUN  (CR)
RUN
```

The "L=" parameter is used to specify loader libraries.

If after loading all of the indicated loader information the loader finds some unresolved external symbols, the loader will try to resolve the symbols by loading subprograms from loader libraries. Normally the standard OS-3 loader library is used; however, other libraries may be used. The standard OS-3 library will be used only if other libraries failed to resolve all of the external symbols. If more than one library is specified, the last library in the list will be examined first. If LIB=NULL is specified, the loader will not try to use the standard OS-3 loader library.

```
#FORTRAN,I=WPLOT,X


NO ERRORS FOR UVACCUM

#LOAD,56,LIB=CALTEK    (CR)
RUN    (CR)
RUN
```

```
#EQUIP,3=FILE
#LOAD 1/R,2,BINPROG
MAP=3    (CR)
MAP    (CR)
```

NOTE: MAP option typed twice

```
SUBPROGRAMS
 73100 POWRF       73446 FORMAT      74176 FLOAT       74211 ABSF
 74222 XTOI        74442 FIXF        74511 Q1Q         74652 BCDOUT
 76143 Q8Q         76513 SIGT        76732 SALI        77331 WRITENTE
 77507 GTSHIFT     77532 READ        77565 TALLY

ENTRIES
 73100 F1.EXOR     73100 Q1QEXRR     74122 Q8QDUMP     74040 PWRTBLO
 74176 FLOAT       74211 XABSF       74211 IABS        74211 ABSF
   .
   .
   .
 76143 Q8QENTRY    77507 GTSHIFT     77352 WRITENTE    77532 READ
 77620 MAIN        00005 PCD.BYTE    00074 LOWMEM      73077 HIGHMEM

DATA BLOCKS
 00020
END

#
```

```
#LOAD,BINPROG,2/R,OVERLAY=OVPROG     (CR)
END   (CR)

#
```

Loader error messages are listed in Appendix A.

LOGOFF

The LOGOFF command is the last command given to OS-3 by a user. A LOGOFF command causes all logical units still equipped to be unequipped.

After the user types the LOGOFF command, the computer will print a summary of his computer use.

An example of the LOGOFF command is:

    LOGOFF

LUNLIST

This command will print the status of all the logical
units a user has equipped. See STATUS command for example
of the output from this command.

Teletype users will not have file size/record count in-
formation printed for the LUNLIST command. To obtain this
information on an individual file or LUN see the STATUS
command.

A program may be restarted by using GO after this command.

An example of this command is:

    LUNLIST

```
MFBLKS  ⎡ =<number> ⎤
        ⎣ +<number> ⎦
```

If the delimiting character on this command is an =
sign, this command will set the limit on temporary (scratch)
file space to <number>.

If the delimiting character on this command is a + sign
this command will set the limit on temporary file space
to the amount currently being used plus number. Thus, if a
user currently has 50 scratch blocks in use the statement

      MFBLKS+10

will set his limit to 60 blocks.

These two forms of this command are useful for limiting
scratch space during program debugging.

If a user does not use either of these statements, the
scratch limit for a job will be the lesser of 100 blocks
and the limit for the job number.

If the delimiting character is neither + or = , this
command will print out the maximum number of scratch blocks
used during this job (MFBLKS) and the amount currently
in use (CFBLKS).

This command may be used without disrupting the status
of a program which has been interrupted. The program
may be resumed by typing GO.

Examples of this command are:

      MFBLKS=175
      MFBLKS+70
      MFBLKS

MI   [,parameter string]

MI means manual interrupt. Since the result of this command
varies with the program currently being run, instructions
for its use are included in all manuals about programs
that use it.

An example of MI is:

     MI

OSCAR $\begin{bmatrix} , & I=LUN \\ & R=LUN \end{bmatrix}$

OSCAR

This control mode instruction calls OSCAR.

OSCAR is a conversational language for use with remote
terminals. Consult one of the many Computer Center pub-
lications about OSCAR for more information.

This control mode instruction will destroy any interrupted
program so that it may not be restarted with a GO command.

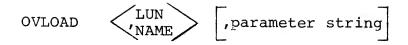An example of an OSCAR control mode instruction is:

    OSCAR

OSCAR,I=LUN

This control mode instruction is used to call OSCAR in a
batch job. The LUN must be previously equipped and will be
used as standard input to OSCAR. If the I parameter is
omitted, OSCAR uses LUN 60 as input.

An example of this form of control mode instruction is:

    OSCAR,I=17

OSCAR,R=LUN

This control mode instruction is used to call OSCAR from
a TV terminal. If the R parameter is used, OSCAR will
record all TV inputs and outputs on the specified LUN.
If the LUN is not equipped, OSCAR equips it as a file.
If the R parameter is omitted, OSCAR does not record TV
inputs and outputs.

An example of this form of control mode instruction is:

    OSCAR,R=35

OVLOAD $\left\langle{\begin{array}{c}\text{LUN}\\\text{'NAME}\end{array}}\right\rangle$ $\left[\text{,parameter string}\right]$

The OVLOAD control mode instruction causes a binary program overlay to be loaded from the LUN or NAME specified.

The unit is rewound, if possible, before loading. After loading, control is transferred to the loaded program.

The parameter string may be included at the option of the user if the program being loaded requires it.

This control mode instruction will destroy any interrupted program so that it may not be restarted with a GO command.

Examples of OVLOAD control mode instructions are:

    OVLOAD,37
    OVLOAD
    OVLOAD,HENRY
    OVLOAD,17,ZIP
    OVLOAD,88,ZDRCH=14,X=5,ZIP

RADAR

This control mode instruction calls RADAR. RADAR is used
to examine, selectively trace, and make on-line changes
to running programs.

For more information see ccm 70-9.

This control mode instruction will destroy any interrupted
program so that it may not be restarted with a GO command.

To use RADAR without destroying the interrupted program's
status see section on BREAK.

An example of a RADAR control mode instruction is:

     RADAR

RELEASE   [,LUN] . . .

If a LUN is a write-enabled FILE or RAF, line printer,
card punch, or plotter, the information stored on it is
destroyed and the file space it used is returned to OS-3.
If a LUN is a magnetic tape, the tape is rewound. If a
LUN is a NULL, nothing is done to the LUN. This is illegal
for a read only FILE or RAF, TV, Teletype or Card Reader.

This command may be given without disrupting the status
of an interrupted program. Execution may be resumed by
using GO.

Examples of RELEASE commands are:

        RELEASE,33,67,21
        RELEASE,32

RENAME[,<old NAME>=<new NAME>[±]]...

This command changes the name of the saved file <old NAME>
to <new NAME>. If the character terminating <new NAME> is
"+" <new NAME> is protected; if the terminating character
is "-" <new NAME> is left unprotected; any other terminating
character leaves <new NAME> with the same protect condition
that <old NAME> had previously.

If the message "RENAME FAILURE--LUN<n>" occurs, the file
could not be saved under <new NAME> and for some reason it
could not be saved again under <old NAME>. The file, which
is not saved, is equipped to logical unit <n>. All other
errors leave the file saved under <old NAME>.

This command does not destroy status so that a program may
be restarted with a "GO".

Examples:

        RENAME,ZOT=*ZIM+
                (change ZOT to *ZIM and file protect)
        RENAME,CREAM=MILK-
                (change CREAM to MILK and remove file protect)
        RENAME,AT15=DONE5
                (change AT15 to DONE5 and leave file protect
                condition unchanged)
        RENAME,ZOT=*ZIM+,CREAM-MILK-,AT15=DONE5
                (do all of the above)

RESET[+] [,First LUN[,Last LUN]]

This command unequips all of the logical units between
"First LUN" and "Last LUN" except those that are file pro-
tected and not saved. If these include logical units 60
and 61, LUN 60 is then equipped to the standard input
unit and LUN 61 to the standard output unit. If only one
parameter is given, it defaults to "First LUN" and "Last
LUN" defaults to LUN 99. If both parameters are omitted,
the "First LUN" defaults to 0 and "Last LUN" defaults to 99.

The + is used to designate the exception for file pro-
tected files. When the + is used, ALL logical units are
unequipped as described above. The + must be the first
non-blank delimiter in the parameter string.

Examples of the RESET command are:

    RESET
    RESET,90
    RESET,10,40
    RESET+
    RESET+,20
    RESET+,40,80

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REWIND   [,LUN] . . .

The REWIND command is used to return the user to the start
of the logical units specified. Any number of logical
units may be rewound using a single command.

All logical units used in a REWIND command must have been
previously defined and must refer to either a magnetic
tape, a FILE, or a RAF.

This command may be given without disrupting the status
of an interrupted program. Execution may be resumed by
using GO.

Examples of REWIND commands are:

    REWIND,45,37,12,99
    REWIND,12

RFP $\begin{bmatrix} \text{LUN} \\ \text{'NAME} \end{bmatrix}$ . . .

The letters RFP are used to indicate Remove File Protect.
Remove File Protect negates the effect of the File Protect
command. (It makes a file write enabled.) LUN must
refer to a FILE or RAF.

After file protection has been removed from a file, it
may be modified at the user's option. File protection
may be removed only by the owner of a file.

If a file is saved, the name must be used instead of LUN.

This instruction may be used without disrupting the status
of a program which has been interrupted. The program may
be resumed by using the GO command.

Examples of Remove File Protect commands are:

        RFP,33
        RFP,83,73,44,10
        RFP,HESD

SAVE [,LUN=<NAME>]. . .

The SAVE command is used whenever the user wishes to store
file information on a permanent basis. LUN must refer to
a FILE or RAF. <NAME> is an identifier of eight characters
or less, assigned by the user to identify the file. (See
File Naming, p.7.) NAME cannot be one of the standard
hardware types (see EQUIP). If LUN was file protected,
the saved file is also file protected. To use a saved
file, the user must have logged in using exactly the same
<job number> and <user number> (unless the file is public
or semi-public).

It is the user's responsibility to remember the names
which he assigns to his saved files.

This instruction may be used without disrupting the
status of a program which has been interrupted. The
program may be resumed by using the GO command.

Examples of SAVE commands are:

     SAVE,83=PROGRAM
     SAVE,22=DATA,14=DATA2
     SAVE,17=*GLERCH
     SAVE,75=↑DATA

SEFB[,LUN[(number)]] . . .

This control mode instruction will cause each logical unit specified to be spaced backward until a file mark is passed, or the beginning of the file is found. A file mark may be thought of as a mark which separates individual subfiles on the same logical unit. Each of the logical units specified must have been previously defined. A logical unit may be listed more than once; the search back command will be executed as many times as the LUN is listed. If it is desired to SEFB any unit more than once, a repetition factor may be used. To do this the number of searches desired is enclosed in parentheses after the LUN. For example,

    SEFB,17(4)

will SEFB unit 17 four times. All logical units listed must refer to either a magnetic tape or a FILE.

This control mode instruction will not disrupt the status of a program which has been interrupted. Execution may be resumed by using GO.

Examples of SEFB control mode instructions are:

    SEFB,21,33,76
    SEFB,37
    SEFB,29(3)

SEFF[,LUN[(number)]] . . .

This control mode instruction will cause each logical unit specified to be spaced forward until a file mark is passed, or the end of the file is found. Each of the logical units specified must have been previously defined. A logical unit may be listed more than once; the search forward command will be executed as many times as the LUN is listed. If if is desired to SEFF any unit more than once, a repetition factor may be used. To do this the number of SEFF desired is enclosed in parentheses after the LUN. For example,

    SEFF,17(4)

will SEFF unit 17 four times. All logical units must be FILEs, RAFs, or magnetic tapes.

This control mode instruction may be given without disrupting the status of an interrupted program. Execution may be resumed by using GO.

Examples of this command are:

    SEFF,39,73,21
    SEFF,35
    SEFF,26(3)

SEND,LUN to <DEVICE>

This command allows a user to send output to a different printer than the one normally associated with the user's job. The only devices currently allowed are:

    PR1   --the standard 512 printer in the I/O room
    UT01   --the printer on the 200 user terminal.

This control mode instruction may be used without disrupting the status of an interrupted program. Execution may be resumed by using GO.

Examples of the SEND command are:

    SEND,17 to UT01
    SEND,99 to PR1

SFBLKS

The letters SFBLKS stand for Saved File Blocks. This
control mode instruction causes the current number of
saved file blocks in use to be printed along with the
saved file block limit associated with the particular <job
number> and <user number> combination. The difference
between the two values listed is the remaining space left
for the storage of saved files.

This control mode instruction may be given without dis-
rupting the status of an interrupted program. Execution
may be resumed by using GO.

An example of a SFBLKS control mode instruction is:

    SFBLKS

START [,<ADDRESS>[,parameter string]]

This control mode instruction causes control to be trans-
ferred to the address specified. The (address) must be
expressed as a six or fewer digit octal number.

Examples of START instructions are:

     START,71653
     START,132014,I=1
     START,0

STATUS

The user should type the command mode instruction STATUS
whenever it appears that a program has completely blown up
and the user is confused as to what went wrong. OS-3 will
respond by typing the content of all registers which may be
helpful to the programmer in trying to figure out what happened.
This command is automatically executed if a batch job terminates
abnormally.

This instruction may be used without disrupting a program
which has been interrupted. The program may be resumed by
using GO.

An example of a STATUS command is:

    STATUS

STATUS, $\begin{bmatrix} \text{LUN} \\ \text{NAME} \end{bmatrix}$

This command is used to get the hardware type and a limited amount of information about a logical unit or named file. The following table defines the status of LUN:

Character	Definition
+	read only (file protect)
[	load point
]	end of data
F	file mark just processed
B	binary record processed
A	abnormal/unavailable
E	address error (RAF only)
S	saved file

The above status is followed by additional file-size/record-count information. On all LUNs except unit-record equipment the number of blocks are printed. If the LUN is a unit-record device, both the number of blocks and the number of records are printed.

A program may be restarted by using GO after this command.

Examples of this command are:

    STATUS,14
    STATUS,DATA

```
TIME  ⌈ =<number> ⌉
      ⌊ +<number> ⌋
```

If the delimiting character on this command is an =
sign, this command will set the time limit to <number>
seconds.

If the delimiting character on this command is a + sign,
this command will set the time limit to the amount currently
used plus number. Thus, if a user has used 50 seconds, the
statement

        TIME+10

will set his limit to 60 seconds.

These two forms of this command are useful for limiting
time during program debugging.

If a user does not use either of these statements, the time
limit for a job will be the lesser of 60 seconds and the
limit for the job number.

If the delimiting character is neither + or = , this
command will print out the time used so far, the maximum
number of scratch blocks used during this job (MFBLKS),
and the amount currently in use (CFBLKS).

This command may be used without disrupting the status of
a program which has been interrupted. The program may
be resumed by typing GO.

Examples of this command are:

        TIME=175
        TIME+70
        TIME

TRAFFIC

This control mode instruction will cause OS-3 to approximate the current system load for the user's reference. This information may be useful for judging response time as the system load increases.

This command may be used before logging in to determine approximate system loading.

This command may be given without disrupting the status of an interrupted program. Execution may be resumed by using GO.

An example of a TRAFFIC command is:

    TRAFFIC

UNEQUIP[,LUN] . . .

The UNEQUIP statement causes the LUN to become undefined. The LUN
may be used in a subsequent EQUIP statement. If LUN was a file
which was not saved, its contents are lost.

If LUN is an output device, such as the printer or card punch,
the information on LUN is sent to the proper output device at
this time. Any logical unit numbered between 0 and 99, inclusive,
may be unequipped, except that Logical Units 60 and 61 should not
be unequipped by batch users.

This instruction may be used without disrupting the status of a
program which has been interrupted. The program may be resumed
by using the GO command.

Examples of UNEQUIP commands are:

        UNEQUIP,4
        UNEQUIP,99
        UNEQUIP,7,15,8

WFM[,LUN[(number)]] . . .

WEOF[,LUN[(number)]]

The Write End of File command instructs the computer to
place a file mark on each of the logical units specified.
A file mark on a line printer will cause a skip to the
top of the next page. Each of the logical units listed
must have been previously defined. If it is desired to
write a file mark on any unit more than once, a repetition
factor may be used. To do this the number of file marks
desired is enclosed in parentheses after the LUN. For
example,

        WFM,17(4)

will write four file marks on unit 17.

The command is illegal for any LUN that is a TV or card
reader.

This command may be given without disrupting the status
of an interrupted program. Execution may be resumed by
using GO.

Examples of this command are:

        WFM,37,69,43
        WFM,76
        WFM,10(14)
        WEOF,11,12,13

APPENDICES

LOADER ERROR MESSAGES

        PPPPP - Subprogram name

        EEEEE - Entry point name.   (FORTRAN function or
                  subroutine name.)

        TTT   - Type of binary loader card (IDC,RIF,XNL,
                  EPT,TRA,EXS)

EEEEE UNDEFINED SYMBOL IN PPPPP

        The external symbol or FORTRAN subroutine name
        EEEEE was used in program PPPPP, but after loading
        no such entry point or FORTRAN subroutine was
        found.

EEEEE DUPLICATE SYMBOL IN PPPPP

        While loading program PPPPP, the entry point or
        FORTRAN subroutine name EEEEE was found a second
        time.   Often this is caused by loading two
        copies of the same subprogram.

Ø TRANSFER SYMBOLS

        After loading all of the programs, no main pro-
        gram had been loaded.   If the number of transfer
        symbols is greater than two it means that more
        than two main programs have been loaded.

NON-LOADER FILE LUN XX
ILLEGAL BCD RECORD LUN XX

        The loader was instructed to load from LUN XX.
        However, the information on LUN XX was not a
        loader file.

PARAMETER STRING ERROR

       An error has been found in the parameter string
       of the LOAD statement.

LOADER CONTROL CARD ERROR

       A statement other than a legal loader control
       statement was found after the LOAD control
       mode statement. This may be caused by mis-
       spelling RUN, MAP, or END.

EOD ON INPUT UNIT

       An end-of-data condition was found.

CAN NOT EQUIP SAVE FILE XXXX

       The loader was asked to equip file XXXX. How-
       ever, either no such file exists, or the file
       is busy.

PPPPP TTT CARD OUT OF SEQUENCE

       Missing, extra, or scrambled cards in a loader
       file.

PPPPP TTT CHECKSUM ERROR

       Either a card has been incorrectly read or
       punched or the card type (TTT) is TRA which
       indicates that there are extra or omitted
       cards. Every binary loader record is check-
       summed except for the TRA card which contains
       a checksum for the complete subprogram.

PPPPP DATABLOCK SIZE ERROR

       A labeled common area in program PPPPP was
       larger than the same labeled common area in
       a previous program and the loader could not

expand the labeled common area without causing
a memory allocation overlap.

PPPPP MEMORY OVERFLOW

Program PPPPP caused the sum of all memory used
by programs and common to exceed 32K words.
This error occurs most often when very large
arrays are being used.

LIBRARY FORMAT ERROR

A file or logical unit was declared a library
but was not in the correct loader library
format.

PPPPP EXS FORMAT ERROR

EXS card not in proper format.

PPPPP EEEEE EXS STRING LOOP

Symbol EEEEE is equated back to symbol EEEEE,
possibly by way of other symbols. (EXS,A=B
and EXS,B=A)

PPPPP EEEEE STRING LOOP

The loader, while following an external linkage
chain, has detected a loop. If this is the only
error, it may indicate that the program that
generated the binary deck PPPPP has made an error.

LUN XX RECORD SIZE ERROR

A record too long for the loader input buffer
has been read.

PPPPP TTT ILLEGAL RELOCATION

Relocatable information is not relocated in a

meaningful way. This error should not normally occur.

NO OVERLAY MADE

An overlay was requested but no information was loaded. Hence the loader cannot make an overlay.

LUN XX REWOUND

Logical unit XX was left at end-of-data. The loader will rewind the unit before reading from it.

LUN XX EMPTY

The logical unit is both at loadpoint and at end-of-data.

Printer Carriage Control

Column 1 of information being sent to a line printer specifies
control of paper movement during printing. This character
will not be printed. Listed below are the control characters
and the action that will be performed before and after
printing.

CONTROL CHARACTER	ACTION BEFORE PRINT	ACTION AFTER PRINT	RESULT WITH STANDARD CARRIAGE TAPE
(blank)	space 1	no action	single space, skip over bottom margin
Ø (zero)	space 2	no action	double space, skip over bottom margin
– (minus)	space 3	no action	triple space, skip over bottom margin
+	no action	no action	overprint
1	eject page	no action	top of page
2	skip to level 12	no action	1" from bottom of page
3	skip to level 6	no action	level 6 is every 6th line
4	skip to level 5	no action	level 5 is every 5th line
5	skip to level 4	no action	level 4 is every 4th line
6	skip to level 3	no action	level 3 is every 3rd line
7	skip to level 2	no action	level 2 is every even line
8*	skip to level 11	no action	
9*	skip to level 7	no action	
Z*	skip to level 8	no action	
Y*	skip to level 9	no action	
X*	skip to level 10	no action	
A	space 1	eject	
B	space 1	skip to level 12	level 12 is 1/2" from bottom of page
C	space 1	skip to level 6	level 6 is every 6th line
D	space 1	skip to level 5	level 5 is every 5th line
E	space 1	skip to level 4	level 4 is every 4th line
F	space 1	skip to level 3	level 3 is every 3rd line
G	space 1	skip to level 2	level 2 is every 2nd line
H*	space 1	skip to level 11	
I*	space 1	skip to level 7	
J*	space 1	skip to level 8	
K*	space 1	skip to level 9	
L*	space 1	skip to level 10	

*These codes work on the 512 printer only

Q+	clear auto page eject	no print	print over page perforation
R+	set auto page eject	no print	skip over page perforation
S+*	set 6 lines per inch	no print	
T+*	set 8 lines per inch	no print	

Note: To use all 136 print positions (i.e. no carriage control) write the record in binary format instead of BCD format. FORTRAN users can do this with the buffer out statement.

*These codes work on the 512 printer only.

+These codes should be followed by a page eject.

APPENDIX C

CONTROL MODE ERROR MESSAGE

This is a list of error conditions that will cause the
OS-3 time sharing monitor to stop the execution of a user's
program. These errors are passed from the OS-3 resident
monitor to the control mode program. The control mode
program then notifies the user of the error condition.

Memory Parity Error

There are two causes of the memory parity error mes-
sage. In all cases the user should expect some of his
memory to have been lost. The conditions which may
cause the memory parity error message are:

1) A magnetic core memory parity error occurring
   in the users memory.
2) An irrecoverable read error when attempting to
   swap in the users memory from a mass storage
   memory device (disk).

Tape Drive Failure

This error message occurs when the tape drive fails to
respond to the commands that OS-3 issues the tape drive.
This may occur when there is no tape on the tape
drive, when the tape drive is manually stopped, or
when the program attempts to read past the last
record on the tape.

Insufficient File Space

The user's program has attempted a write or WFM
instruction that will cause the user to exceed his
scratch or saved file space limit. The user may
determine which limit he has exceeded by examining the
status of the logical unit which caused the insufficient
file space. If the file is a saved file, the user has
reached the limit of his accounts allocated saved file
space. If the file is not a saved file, there are
two limits that the user may have reached. The user's
account has a scratch file space limit and the user
may declare a temporary limit by using the MFBLKS
command. The temporary limit is initially set to
100 scratch file blocks when the user logs on.

Each file block contains about 2000 characters of
information, depending on the length of the records.
There is an "overhead charge" of one saved file block
for each saved file name.

Memory Protect Violation

The user's program has attempted to store into pro-
tected memory. This may indicate that a system program
(such as FORTRAN or OSCAR) is not operating correct-
ly. The program may be continued by using the "GO"
command. Please contact the computer center.

File Protect Violation

A write, WFM, or release instruction has been attempted
on a protected file or RAF or on a tape containing
no write ring.

LUN Undefined

A read, write, seek or control (except status) has
been attempted on a logical unit that is not equipped.

The user may equip the unit and then use the "GO" command to continue running his program.

Illegal Instruction

This message may be generated when a program attempts to execute an instruction which the computer (and OS-3) does not recognize or for some reason cannot execute. Listed here are the instructions which are illegal.

1) All halt instructions.
2) All BDP instructions when the BDP is off.
3) An XREQ (71) instruction when any of the following conditions exist:

    A) Index 1 contains an undefined value.

    B) Index 1 is less than six and the effective address is greater than 99.

    C) Index 1 is seven (zeropage) and the effective address is greater than 37 octal.

4) A Cntl (72) instruction when any of the following conditions exist:

    A) The Q register is larger than 11 octal (illegal function code).

    B) Functions other than 0-3 on a LP, PUN, PLOT, PTP, or TASK.

    C) Functions other than 0-1 on a MSF, TV, or the batch standard input unit.

    D) Functions other than 0-2 on a TTY.

    E) Functions other than 0-5 on a RAF.

    F) Functions other than 0, 1, or 3 on a destructive read file.

5) A seek (73) instruction on any device except a RAF, NULL, or MSF.

6) A read (74) instruction when any of the following conditions exist:

A) More than 250 words are specified on a read from a TV.

B) More than 20,000 words are specified on a read from a tape.

C) A read from a LP, PUN, NULL, PTP, PLOT, or TASK.

D) A read from a file at end of data.

E) A read from a RAF or MSF with address error condition present.

F) A read of zero length from a RAF or MSF.

7) A 75 instruction.

8) A write (76) instruction when any of the following conditions exist:

A) The length is zero.

B) A write is attempted on a destructive read file.

C) The address error bit is set on a RAF or MSF.

D) The length is too large on a LP (34 words), PTP (62 words), TV (250 words), magnetic tape (20,000 words), or PUN (20-40 words).

9) Any of the following instructions:

77200000 - 77277777
77400000 - 77517777
77650000 - 77707777
77730000 - 77747777
77770000 - 77777777

10) A CTI instruction when the user is not at a teletype and a parameter string does not exist.

11) A CTO instruction when the user is not at a teletype terminal

12) An ACI instruction when the parameter string is too long (80 characters).

Time Cut

The user's time limit has been exceeded. There are two
limits. One limit may be changed by using the "TIME"
command. This limit is initially set to 60 seconds
when the user logs on. The other limit is associated
with the user's account and may be changed only by
contacting the computer center.

Operator Termination

Operator termination may occur when the computer
operator ends the OS-3 operating system. It will
also occur if the operator terminates a specific user.

Abnormal I/O Condition

This error occurs when the OS-3 operating system
discovers an abnormal condition while attempting to
execute a read, write, BKSP, FWSP, SEFF, SEFB, or WFM
instruction. This may indicate that the file structure
is defective, or the data on the disk cannot be read.

Operator Abort

The operator has terminated the current phase of the
user's job.